VOLUNTEER INFORMATION CONTRIBUTION TO GLACIER MAPPING

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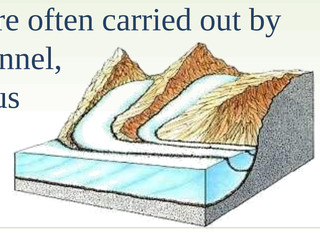
FRAMEWORK

GLACIERS

Glaciers represent valuable proxies of the Earth surface changes in energy and water budgets, and so fine indicators of **climate change.** Glaciers dynamics ranges from seasonal to long-term patterns. Parameters used to represent their state (i.e. accumulation area, snow depth, terminus position, ...) should be monitored at least once per year, at best at the end of the ablation season. The **monitoring** of Alpine Glaciers are often carried out by non-professional, volunteer personnel, usually leading to an heterogeneous and **non methodical collection** of data in space and time.

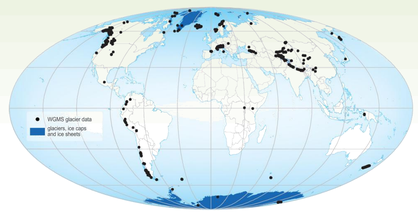


DATA COLLECTION

The monitoring of glacier is usually performed by integrating historical data, annual in situ measurements and remote sensing products. Italian **volunteer operators** perform the **annual observation** campaign in the field, in coordination with local and national authorities. They collect measurements following different **local protocols,** and delivery them to the campaign managers. The volunteer character of contributions often causes some problems in validating, processing, and disseminating glaciological data, making it difficult to build effective glaciological databases and maintain them up to date.

MAPPING DATA

Glaciers observations locally collected are aimed, after some processing and harmonizing steps, to populate regional, nationals and internationals **inventories** as well as to compile official environmental **databases** and **reports**. These efforts contribute to the understanding of glaciers dynamics, and subsequently to the estimation of trends for the definition of future scenarios.



INSTRUMENTS

WEB 2.0

Geography and geomorphology, as well as many scientific disciplines, have been recently involved in the phenomenon of **user generated content** on the internet, strictly linked to the Web 2.0 technological framework. Several web users exploit the possibilities offered by web 2.0 to enrich **web documents** by uploading their own materials: pictures, comments, tags, links and information in general. So that the web has become a dynamic exchange place , where to **share knowledge** and experiences.

NEOGEOGRAPHY

As an intersection between the user generated content concept and the geographic information realm, a new branch of geography took place: the neo-geography. In this context, web users have become themselves producers of **geographic information**. They take advantage of a growing number of **mobile technologies** - platforms, devices and applications – interconnected and widely spread over the world, to collect, upload and **mash-up** together geo-referenced materials on web platform and applications.

V.G.I.

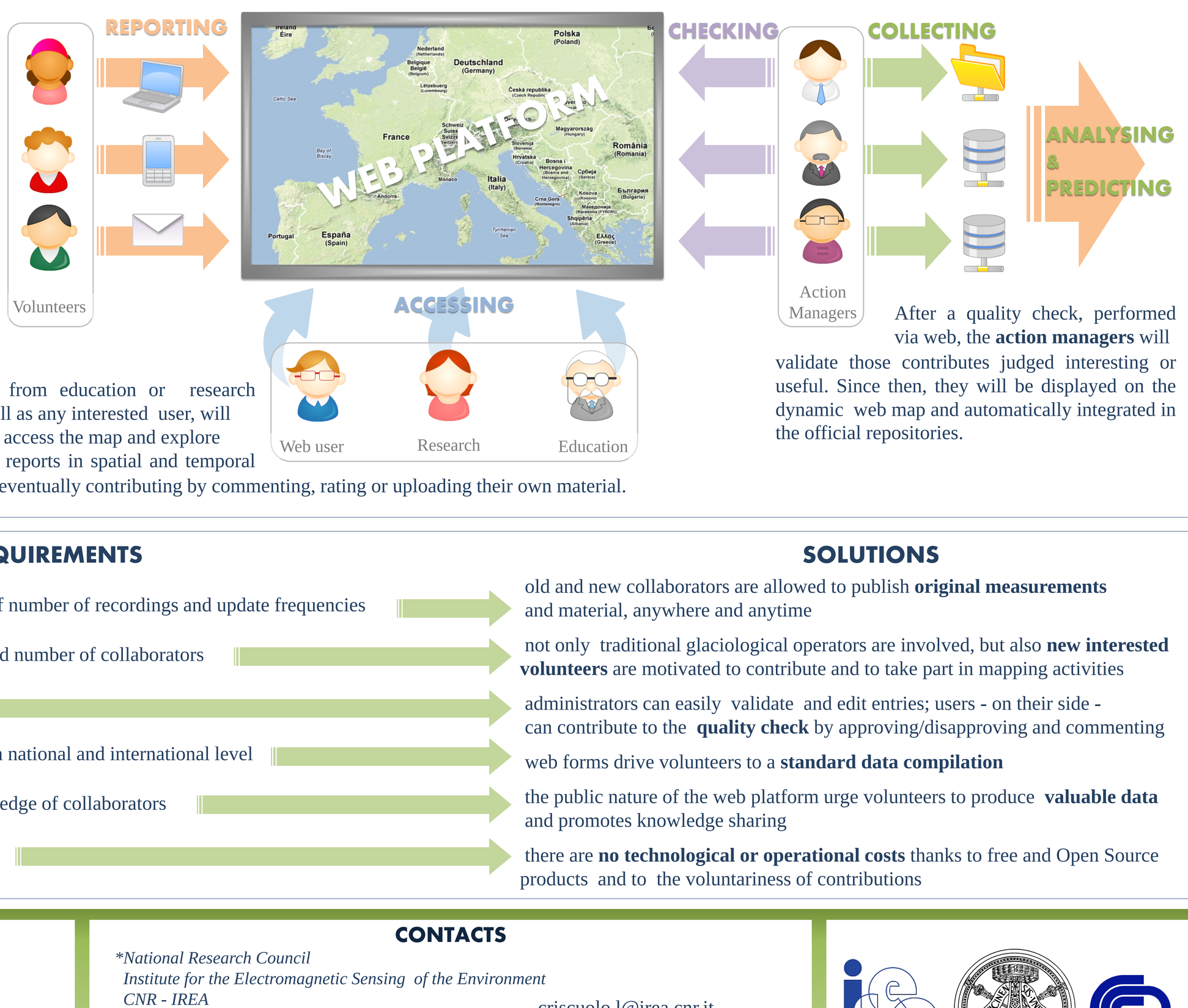
Neo-geographers, who voluntarily produce and share geo-information on the web, are the core of **Volunteered Geographic Information.** By involving users' experience, knowledge and sensibility in **participative projects,** the V.G.I. approach helps in creating, validating, enriching and spreading geo-information. Users' mobile devices set up a diffused **network**, able to operate even in remote areas and extreme conditions. V.G.I. can help scientists and public authorities to enlarge geographic datasets with specialised local-based knowledge, helping them in understanding environmental and social phenomena.

MODEL

The introduction of a V.G.I. approach in the context of glacier monitoring, and in the consequent mapping activities, take place by means of an operational workflow, which involves both human actors - expert operators, new volunteered contributors, campaign managers, web public – and web 2.0 technologies.

Expert glaciological operators will report , by means of web forms, measurements collected in situ, and upload them on an on-line platform.

Volunteered amateurs (e.g. mountain guides, hut keepers, hikes..) can similarly submit web reports, containing for instance pictures, information and alerts related to the glacier contest.



Web public from education or research realms, as well as any interested user, will be enabled to access the map and explore the approved reports in spatial and temporal dimensions, eventually contributing by commenting, rating or uploading their own material.

After a quality check, performed via web, the **action managers** will validate those contributes judged interesting or useful. Since then, they will be displayed on the dynamic web map and automatically integrated in the official repositories.

RESULTS

REQUIREMENTS	SOLUTIONS
improve **collections** in terms of number of recordings and update frequencies	old and new collaborators are allowed to publish **original measurements** and material, anywhere and anytime
enlarge **public engagement** and number of collaborators	not only traditional glaciological operators are involved, but also **new interested volunteers** are motivated to contribute and to take part in mapping activities
control **data quality**	administrators can easily validate and edit entries; users - on their side - can contribute to the **quality check** by approving/disapproving and commenting
pursue **data harmonization** on national and international level	web forms drive volunteers to a **standard data compilation**
improve **awareness** and knowledge of collaborators	the public nature of the web platform urge volunteers to produce **valuable data** and promotes knowledge sharing
involve no additional **charge**	there are **no technological or operational costs** thanks to free and Open Source products and to the voluntariness of contributions

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